



Technology Transfer through Foreign Direct Investment in Sri Lanka

Dilupa Nakandala¹

Introduction

Foreign Direct Investment (FDI) in the world economy had increased by 38% in 2007 compared with a 29% increase in 2005 (UNCTAD, 2007). FDI can yield major direct economic benefits such as capital formation, tax revenues and employment and indirect long run benefits including a positive influence on the performance of the domestic firms in the host country (Blomstrom and Kokko, 2001). When developing economies are the host economies, they receive the benefits of employment generation, skills and technology transfer, exports and economic development and productivity improvements (UNCTAD, 2007).

FDI plays an important role in the growth process of developing countries. The growth enhancing effects of FDI are stronger in countries which have export promoting policies rather than import substituting policies (Balasubramanyam et al., 1996). FDI has been promoted as a vehicle for development by many developing economies for decades. In addition to the direct benefits, host countries expect to receive indirect long term benefits such as transfer of technology through FDI, yet the experience in many developing countries is that only limited technology spill-over occurs.

This paper compares Sri Lanka with several other Asian countries that have similar characteristics, but with better development of technological capabilities. As Sri Lanka was the first country in South Asia to open its economy for free trade, it is important to study the extent of technology spill over to the country over the last

¹ Centre for Industry and Innovation Studies (CIIS), College of Business, University of Western Sydney, Locked Bag 1797, Penrith South DC, New South Wales, Australia 1797. Phone: +61 2 9807 4291, +61 4 3261 0748 (Mobile); Fax: +61 2 9685 9499; Email: D.nakandala @uws.edu.au

thirty years. From an analysis of the available data, this paper identifies that Sri Lanka is backward in high technology exports when compared with Indonesia and Philippines, though all three countries share similarities in other characteristics. This finding stimulates the need for further research in the context of Sri Lanka on analysing why the technology spill over is low from FDI.

The success of the technology transfer from the foreign source firm to the host firm has a direct impact on the subsequent technology spill over to the domestic industries in the host economy (Marin and Bell, 2006). A research study is being conducted in order to gain an insight of the technology transfer to Sri Lanka from FDI. A set of preliminary observations drawn from a very recent field study conducted in Sri Lanka will be presented in this paper. The observations were of human resource inter-relationship between foreign and local managers and mainly on the skills and experience of technology managers, managerial autonomy given to the local management, external and internal communication, transfer of technology and the applicability of the transferred technology.

The preliminary observations of field work carried out for the present study suggest that skills and the experience of local management has been important in enabling even an incomplete technology transfer to be operational. Also the limited autonomy given to the local management and the subsequent more limited confidence and mutual understanding of local managers in their technical ability and operability had also been observed. Importance of prior complete negotiations and agreements on the technology transfer was highlighted in several cases in the field study.

1. The Problem and Objectives

Sri Lanka is a developing economy and was the first country in South Asian region to liberalize its economy in 1970s. Radical economic reforms introduced in 1977 changed the economy to be outward oriented from the previous inward oriented, agriculture based economy. The liberalization of economy in 1977 significantly promoted FDI inflow, and the foreign investment promotion policy has been consistently followed throughout the years in spite of changes in the political context (Athukorala & Jayasuriya 2004). Though Sri Lanka liberalized its economy before

many other developing economies, it has not achieved its expected development outcomes within last 30 years. This paper aims to provide an insight on the development differences on Sri Lanka with several other countries having similar characteristics.

The second underlying objective of this research is to investigate how the level of involvement of local management in host firms in Sri Lanka affects the technology transfer. Marin and Bell (2006) suggested that the depth and the success of technology transfer from the source firm to the host firm had a direct impact on subsequent technology spill over to the domestic industries in the host economy. Technological impact to the host economies is the outcome of two linked steps that are technology transfer from the Multi National Corporations (MNC) to the host firms and the subsequent step of technology spill over from the host firms to the domestic firms in the host economy. Even though the technological spill over in the developing economies has many determinant factors, it has significant effects from the level of transfer of technology at the firm level from MNCs to their host firms in the developing economies.

This raises the question of what host firms can do to absorb the technological capabilities from the technology transfer through FDI. To determine this further investigation has been carried out in the context of Sri Lanka on the technology transfer at the firm level from the host firm's perspective. This paper gives preliminary observations of an ongoing study which investigates the technology transfer from source firms to the local firms in Sri Lanka.

The technological impact to the host economy from FDI consists of two steps such as the international technology transfer from the Multinational Corporations (MNC) to the subsidiary in the host economy followed by the technology spill over effect to the domestic industries in the host economy. Though the second step of the technology spill over has attracted growing attention, most of the studies take the two steps linked together such that the technology transfer from the MNCs to the host firms provide the base of the technology spill over. The technology is first transferred to the host firm from the MNC and then to the domestic firms through spill over (Marin and Bell, 2006). Several previous studies have investigated the second step of the spill over aspects in various host economies (Kokko, 1994; Blomstrom and Sjöholm, 1999;

Dimelis and Louri, 2002). The international technology transfer from the source firm to the host firm through FDI is presumed to have occurred and the subsequent step of technology spill over has attracted an extensive focus in the studies.

There are different determinant factors of FDI across the nations. One of the attractions of increasing FDI is that technology and expertise may spill over to local suppliers, customers, and competitors (UNCTAD, 2005). The foreign investor enterprises transfer the advantages possessed by them such as specific skills and knowledge to the local partner to get the maximum returns. Therefore, the FDI usually transfers more than capital investment across the nations. In the manufacturing industry, transfer of marketing expertise as well as the technological advantages such as low cost production processes or a better engineered product may also be included. The entrepreneurial and managerial skills are frequently transferred to the host enterprises (McKern, 1993). Also the specific or localized features of a firm's technology are non codifiable. Even the codifiable parts of the technology are of limited value to the recipient, as they need developing complementary skills, routines and supporting technologies if the recipient is to develop their own equivalent technology. Therefore, there need be no lack of trust between the two firms in technology exchange (Cantwell, 1999). Borensztein et al. (1998) suggested that FDI is an important vehicle for the transfer of technology, contributing to growth in larger measure than domestic investment. Moreover, the contribution of FDI to economic growth is enhanced by its interaction with the level of human capital in the host country. FDI is more productive than domestic investment only when the host country has a minimum threshold stock of human capital.

However, as shown in this paper, Sri Lanka does not seem to have benefited from large flows of FDI over many years. This research paper seeks to analyse the reasons for this limited spillover by analysing the technology transfer to the host firm from the source firm through FDI. This paper compares Sri Lanka with several other Asian countries that have similar characteristics and then identifies underpinning factors for the technology transfer process through FDI. It is based on ongoing research that is empirically investigating the determining factors of technology transfer between firms through FDI with the aim to explore the influence of host firm management

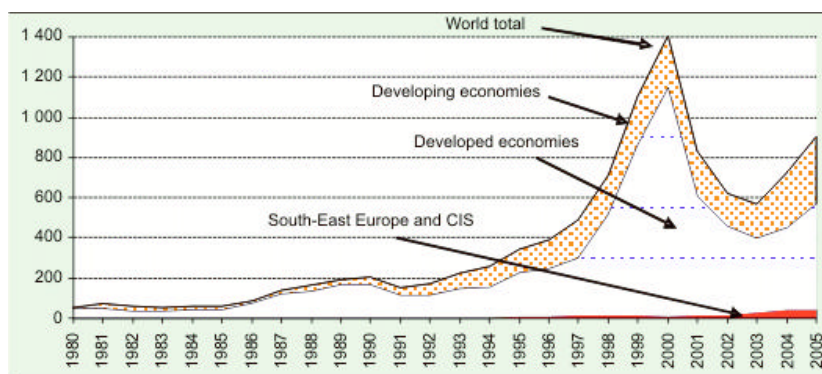
involvement in technology transfer from the source foreign firm to the local host firm by conducting a firm level study in Sri Lanka.

2. The Process of Technology Spillover

According to Kokko (1992), there are at least four ways that the technology diffuses from foreign investment enterprise to other firms in the host country: Those are demonstration - imitation effect, competition effect, foreign linkage effect, and training effect. The technological competence is not self transferable or copied through spill overs to other firms as it consists of the source firm's distinctive technology. The objective of building technology competence is that to build up similar skills and routines to those in the source firm, but adapted to fit with the host firms specific traditions and reflecting its different nature (Cantwell, 1999). Lake (1999) identified three levels at which the activities of MNCs affect the host country industries and at which the diffusion of technology occurs: market level (customers and suppliers), production level (processes, techniques) and the R&D level (ongoing R&D core and support programs). He further commented that the rate of diffusion or imitation of technology may marginally have been influenced by the rivalry among MNCs in the industry.

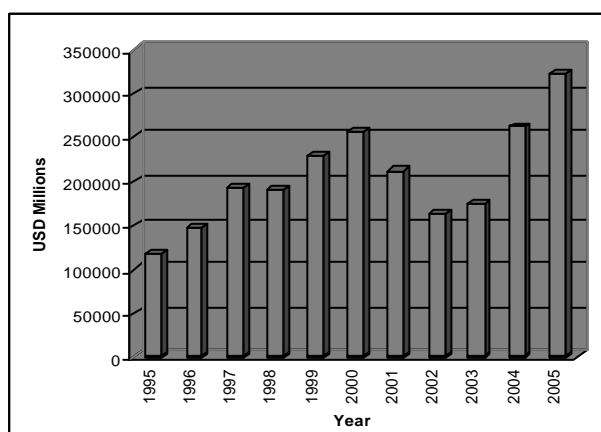
MNCs bring some amount of the proprietary technology that may be related to the product and production process, marketing skills and organizational advantages (Blomstrom and Kokko, 2001). Successful transfer of technology to the host firm depends on various determinant factors such as manufacturing experience of the host firm (Teece, 1977), human resources (Tung, 1994), training (Farhang, 1999), transfer environment in the supplier and host firm countries, and the absorptive capacity of the host firm (Baranson, 1970).

3. Global FDI & Technology Transfer



As shown in the figure 1, global FDI inflow has been increasing gradually over the years and there had been a sharp increase during 1998 and 2000 followed by a sharp decline from 2000 to 2003. The majority of the FDI inflow is to the developed economies, while the developing economies also experience increasing FDI Inflow. FDI inflows remain the largest component of net resource flows to developing countries (United Nations, 2006).

As illustrated in figure 2, FDI to developing economies had risen to a very high level as \$334 billion and the percentage share was 29% of the total FDI Inflow in 2006. Out of that investment, majority was in Asia (\$259,434mn from the total FDI Inflow of \$379,070mn to the developing economies).



In FDI, most of the source enterprises use advanced technologies compared with the domestic host enterprises. The host enterprises can benefit from technology transfer from the source to the host enterprise through FDI. Furthermore the domestic

industries in the host country can benefit from technology spillovers from foreign firms to the industry.

4. Intellectual Context

4.1. Definitions and Concept

4.1.1. Foreign Direct Investment

The International Monetary Fund (1993) and the Organisation for Economic Co-operation and Development (1996) have defined FDI as an investment made to acquire lasting interest in enterprises operating outside of the economy of the investor. Further they suggested a threshold of 10 percent of equity ownership to qualify an investor as a foreign direct investor. Further, the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD) note that the direct investors may be individuals; incorporated or unincorporated, private or public enterprises; associated groups of individuals or enterprises; governments or government agencies; or estates, trusts, or other organizations that own direct investment enterprises in economies other than those in which the direct investors reside. The members of an associated group of individuals or enterprises are, through their combined ownership of 10 percent or more, deemed to have an influence on management that is similar to the influence of an individual with the same degree of ownership.

4.1.2. Technology

Technology is defined in embodied and disembodied forms. Sharif (1986) defined the technology as a form of social relationship. He identified 'technology' having three components such as hardware, software and brainware, which are co-determinant and equally important, and concluded that the circular balance of these three components must be restored purposefully. Therefore, there is a fourth component of technology which is the most important, and that is the technology support network which is the structure in which the technology is embedded.

Khalil (2000) expanded the above definition of technology and identified a fourth component of know-how, which is the learned or acquired knowledge of a technical skill regarding how to do things. Technology is also seen as the way we do things

which is the practical implementation of knowledge, and therefore defined as the knowledge, products, processes, tools, methods and systems employed in the creation of goods or in providing the services.

Technology Atlas Team (1987) defined the technology in embodied forms: object-embodied technology, person-embodied technology, document-embodied technology and institution-embodied technology. According to their definition of technology, there are four basic components of technology being Technoware (object-embodied technology), Humanware (person-embodied technology), Inforware (document-embodied technology) and Orgaware (institution-embodied technology). This definition had been formed based on the resource transformation process and it had been noted that in any resource transformation, all four components of technology are required simultaneously. No transformation can take place in the complete absence of any of these components. Ramanathan (1994) elaborated the above embodied form of definition comprehensively for manufacturing technology by expanding the composition and the structure of each of the four components.

According to Pavitt (1999) a key characteristic of technology is its partial tacitness. Therefore the technology can't be completely codified. Learning through experience, examples and training is an essential feature of technological accumulation. He further pointed out that negligence of the tacit element in technology could lead to policies and practices that turn out to be unproductive. Therefore possible absence of proper transfer of non codified components of technology will make the technology transfer incomplete, causing less success in the effective use of transferred Technoware.

4.2. Key Studies

Research & Development (R&D) had been frequently used as a proxy to measure the absorptive capacity of organizations. Marin and Bell (2006) questioned this choice when they found that the investment in R&D was an unimportant factor in technology spill over. On the other hand, Cohen and Levinthal (1990) argued that the firm's absorptive capacity is an important factor, and in turn the innovative performance is history or path dependant. The ability to assimilate information is cumulative and depends on the existing knowledge structure. He further argued that the firm's

absorptive capacity is not only the sum of the absorptive capacities of the individual employees but also depends on the interface with external environment and on how the knowledge is transferred across and within the sub units of the organizations. Therefore the organization capability depends on the capabilities of both the gatekeepers who interface with the external environment, and the expertise of the staff to whom the gatekeepers transmit the information. An important point from this study is the argument on the difference between the individual absorptive capacity and the organizational absorptive capacity.

Vachani (1999) studied how the global diversification has affected the management of multinationals i.e. he examined the linkages between the global diversification and subsidiary autonomy. He found that the autonomy in manufacturing decisions varied a great deal. Within a functional area, the nature of the decision influenced the autonomy level. This variation depends on where the appropriate information for decision making was likely to be located and whether it is strategic or operational. He found that the autonomy of strategic decisions is with the parents and the operational decision making is with the subsidiary.

Booz (1997) explored the role of boundary spanners in the technology transfer. He identified three primary functions: uncertainty reduction, information processing and representing. Quoting Douglas (1991), Booz (1997) suggested that 'global uncertainty' has an influence on the person's effectiveness and each initial episode is a product of past interaction performance and the recollection of those performances. The second function of boundary spanners is that of information processing which is acquiring, selecting, and filtering information. The third function of representing is managing the organizations reputation by the boundary spanners. He reviewed five strategies that can be used individually or combined by boundary spanners. Booz's (1997) discussion was not specifically on two organizations of different countries having different cultures, but it discusses a general scenario in organizational interactions. In technology transfer, constant communication between the source and host firm is very important to realize the actual benefits.

4.3. Guiding Propositions

A number of propositions concerning the role of managers in the technology transfer process emerge from the above discussion. These are currently being explored in more depth in the context of Sri Lanka.

P₁: The formal education level of the technology managers in the host firm affects the success of technology transfer.

P₂: When the technology managers have previous experience in working in international engagements, the level of uncertainty will reduce and their confidence level will increase. This will result in an active involvement of the host firm's management in technology transfer.

P₃: Autonomy given to the technology managers in technology related functions such as approving technology projects, monitoring and controlling quality, in house developments and determining the employee related matters in technology functions etc. will positively contribute to successful management of technology transfer.

P₄: When the technology managers have external linkages with other professional bodies, it provides the access to the information and knowledge. Such external linkages will be a supporting factor to absorb the new technology that had been transferred.

P₅: When the technology managers have strong communication links with other units within the organization, the transfer and the absorption of the technology is facilitated.

5. Methodology

5.1. Research Setting:

The reasons for selecting Sri Lanka as the case study for this investigation are two-fold. Primarily, the writer, being a Sri Lankan, has the personal interest to investigate and produce an outcome that will be useful to the development of Sri Lanka. The

writer believes that the output of this research will contribute to the policy developments by Sri Lankan government at a macro level and negotiations of FDI agreements by the host Sri Lankan firms at the micro level.

Secondly, being the first country in south Asia to open the economy and promote the FDI over the years, Sri Lanka has a continuous experience in FDI as illustrated in figure 3. However Sri Lanka has not developed its technological capability over the years as it had been expected when they opened the economy in 1970s. Sri Lanka has not been studied extensively in previous studies, and the writer could not find any studies on the role of management in the host firms in FDI in Sri Lanka.

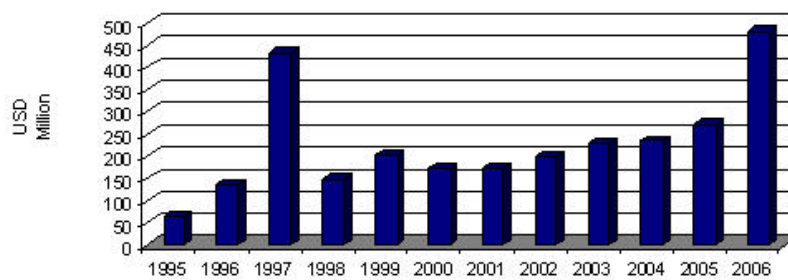


Figure 3. Inward FDI in Sri Lanka

Source: UNCTAD Statistics

5.2. Research Design

The analysis undertaken to investigate the effects of FDI in Sri Lanka has been conducted in two phases:

5.2.1. Phase 1:

The information for several Asian countries was gathered from COMTRADE database of United Nations, World Investment Report (2006), UNCTAD and country profiles from World Bank. The information was carefully consolidated to generate information about countries to identify similarities and differences.

The data was filtered appropriately and tabulated for clear interpretation. The attempt to get further information from relevant central banks for selected countries was unsuccessful though the writer requested them electronically. The definition of high-technology exports were adopted from United Nations as the products with high R&D

intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.

5.2.1.1. Definitions for the Research

Source Firm and Host Firm

The definitions proposed by the OECD and IMF are commonly adopted by researchers. Therefore the term foreign direct investor or the source firm as defined in the scope of this research primarily is based on the OECD and IMF definition. The suggested difference is that individual direct investors are omitted from consideration. The foreign direct investor is defined only as the incorporated or unincorporated private or public enterprise; associated groups of individuals or enterprises; governments or government agencies; or estates, trusts, or other organizations that own direct investment enterprises in economies other than those in which the direct investors reside. Therefore the forms of which wholly-owned subsidiaries, joint ventures and foreign holdings are taken because the mode of technology transfer is internal in the above forms.

The host firm for the scope of this research is a local firm in case of a joint venture. In case of the wholly owned subsidiaries, the local representative of the MNC will be taken as the host firm as it will ultimately receive the technological benefits and be controlled by the local staff in management and operation levels.

Technology

The definition of technology using the embodiment perspective provides a better clarification of the term and the four forms defined as Technoware, Humanware, Inforware and Orgaware (Technology Atlas Team, 1987) gives a more practically applicable definition. The definition was clearly articulated in the questionnaire and described to all the participants in the interviews.

5.2.1.2. Data Collection & Analysis

Questionnaire survey

The questionnaire survey method had been adopted by Vachani (1999) and Edwards et al. (2002) in investigating the autonomy of subsidiaries. This research also used a questionnaire survey followed by semi structured interview in data collection.

The questionnaire was in English considering the good language skills of Sri Lankan managers. The questionnaire consisted of multiple sections with close ended and open ended questions. The questionnaire was developed mostly based on or from the literature. The questions to measure the managerial autonomy of the host firms were developed based on the studies of Edwards et al. (2002) and Vachani (1999). The capabilities of the managers in three primary functions of uncertainty reduction, information processing and representing proposed by Booz (1997) have also been used in developing the questions to measure the absorptive capacity.

The survey was carried out in FDI firms in manufacturing industry located in Colombo and Gampaha districts in Sri Lanka. Prior to the field study, a pilot study had been conducted in order to verify the validity of the questions. Seven responses had been received from the professionals in firms with FDI and professionals who have worked in such firms. All the respondents were Sri Lankan professionals. Several questions had been revised for greater clarity after receiving the responses in the pilot study.

The list of the BOI registered manufacturing firms (under section 17 and section 16-normal law) which were in operation as at end May 2008 had been received from the BOI, Sri Lanka. That data had been sorted to filter the firms having foreign investment to identify the sample firms for survey. From 1062 firms in the received list from BOI, there were 784 firms having foreign investment. 202 firms were selected under the criteria on foreign investment more than US\$ 40mn and the location in either Colombo or Gampaha Districts. The questionnaire was initially mailed to all the identified sample firms and then those were contacted for scheduling interviews. Figure 4 illustrates the industry distribution of the sample firms. 26 interviews were carried out and 22 responses were received through email and post.

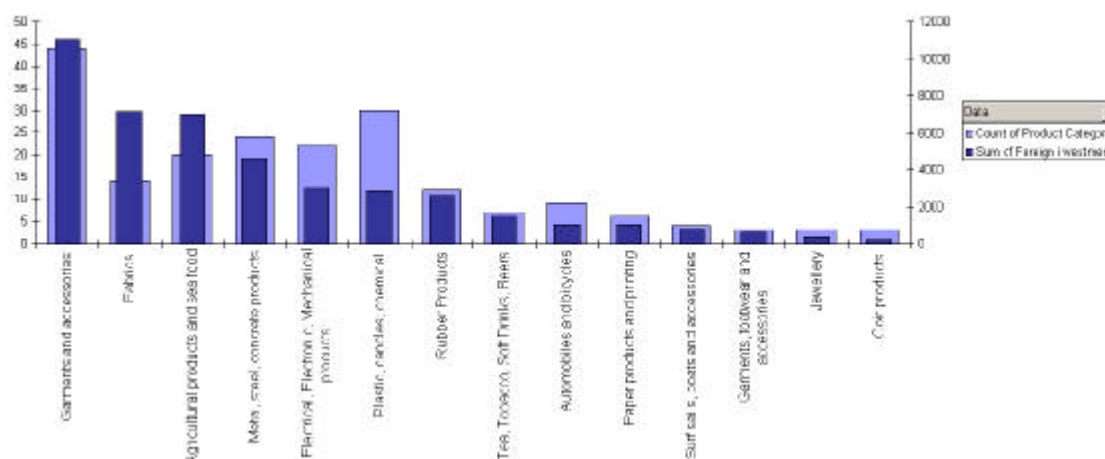


Figure 4. Industry Distribution of Sample Firms

6. Findings

6.1. Comparison of Sri Lanka

In the compilation of information on the countries discussed above several important facts were identified. The comparison matrix presented below summarises the differences of Sri Lanka compared to several other countries in Asia.

Though there are no two countries having exactly similar characteristics, some similarities could be identified among countries like Sri Lanka, Indonesia and Philippines and the comparative matrix in table 1 illustrates the similarities and the differences. Sri Lanka, Philippines and Indonesia have differences in the land area, and the population. However they share almost similar characteristics of approximately similar GNI per capita values such as \$1160, \$1300 and \$1280 for Sri Lanka, Philippines and Indonesia respectively. Considering the data on the GDP composition, services has dominated in all three countries followed by the industry and then agriculture. However, the contribution from the industry to the Sri Lankan economy is comparatively lower than other two countries. Literacy rate in all three countries is also above 90%.

However when the high technological exports are considered, Sri Lanka is at a very low level such as 2% compared with Philippines at 64% and Indonesia at 16%. That finding was important as Sri Lanka performs quite similar to the other two countries when the GNI per capita is considered but perform poorly in technological exports.

The main objective of this present project is to seek to understand more about why this is the case.

Country	Sri Lanka South Asia	Philippines SE Asia	Indonesia SE Asia
Area (sq km)	65,610	300.0 thousand	1.9 million
Population (2005)	19.6 million	83.1 million	220.6 million
GDP \$(2005)	23.5 billion	98.3 billion	287.2 billion
Literacy Rate % (in 2004)	90.7	92.6	90.4
Foreign direct investment, net inflows (BoP, current US\$) 2004	233 million	469.0 million	1.0 billion
FDI Net Inflow/GDP 2004	0.99%	0.48%	0.35%
FDI inward stocks as a % of GDP 2005 (Outward)	10.4 (0.7)	14.4 (2.1)	7.7 (5.0)
GDP composition 2000			
<u>Agriculture, value added (% of GDP)</u>	19.9	15.8	15.2
Industry, value added (% of GDP)	27.3	32.3	31.9
<u>Services, etc., value added (% of GDP)</u>	52.8	52.0	52.9
GDP composition 2005			
Agriculture, value added (% of GDP)	16.8	14.4	14.0
Industry, value added (% of GDP)	26.1	32.6	40.7
<u>Services, etc., value added (% of GDP)</u>	57.1	53.0	45.3
High technological exports (2004)	2%	64%	16%
GNI \$ 2005	22.8 billion	108.3 billion	282.2 billion
GNI per capita \$ 2005	1160	1300	1280

Table 1: Country Comparison Matrix

6.2. Preliminary Observations from the Research Work

The preceding sections of this paper introduced a series of propositions to explain why Sri Lanka has fared more poorly than other comparable countries in benefiting from technology spillover through FDI. The issues confronted in this paper concern the human resource inter-relationship between foreign and local managers. In order to

explore these propositions systematically a series of semi structured interviews were conducted with the technology managers in the firms having foreign investment in Sri Lanka. The interviews were conducted with the technology managers who manage the production/manufacturing, technology procurement, engineering maintenance functions in those firms. Several preliminary observations were identified. These are discussed in the concluding sections of this paper.

Skills and Experience of Technical Managers

A high percentage of technology managers had either undergraduate degree or post graduate degree and they have worked in the industry over 5 years. There were some managers who had over 10 year experience. Most of them had the experience in dealing with international stake holders. Clearly their experience and international exposure was limited to the interactions with international suppliers. Most of them have successfully engaged in technical evaluations, but they had less involvement in negotiations, supplier selection other procurement related activities.

Almost all of the respondent managers had been involved in international technology transfer especially in the asset transfer, skills development and implementation and such involvement has been primarily on technical operation level.

There was one special case where the expatriate technical managers had remained in control for over ten years. Those expatriates had used their industry experience when the plant was commissioned about 10 years ago but their skills had been now outdated as the new technologies specially in industrial engineering have emerged. This seems to suggest an internal conflict between the longer stayed expatriate managers and the local managers who have more recently joined with the firm as the new implementations. Local managers referred to this tension as a constraint generated by the expatriates' poor trust with the local managers' capabilities.

Managerial Autonomy

Local managers had mostly been given adequate autonomy enough for the continuous operation of the firm. Most of the managers expressed their confidence in gaining approval for capital projects. However, the funds for capital projects are primarily

controlled by the board of directors which has foreign firm representation. No local managers in any of the firms had autonomy for approving funds for capital projects but they all seemed to have confidence in their capacity to get funds approved for the business cases where they had strong business requirements. However, a few managers raised the concern that because of that constraint, they have to spend time in explaining the local environment and the business need in every case as it seems to be difficult for the decision makers to readily grasp the operational aspects in the local plant. Except for a few managers who noted that they have been provided with adequate autonomy, most claimed that more autonomy should be given to the local management for approving capital expenditure, at least for a reasonable fund level.

Interestingly, none of the managers had restrictions on the supplier selection for capital projects. The control from the foreign firm was on the capital expenditure approval but the local managers had full power in decision making for all other procurement related work. However, there seemed to be involvement from foreign firm in the procurement process if the local managers believe that the foreign firm has more access to the new technologies and negotiation power with international suppliers. That involvement from the foreign firm generally comes on request from the local managers.

It seemed that the foreign firm has given full autonomy to hire the staff up to the management level but except in a few firms, foreign firm's involvement was present in hiring the management level employees. There are expatriate managers in some firms at the positions such as the chief executive officer or the managing director but the expatriates were not common in operational management level. In the discussion on the historical perspective, it was observed that the expatriates had been commonly present before the commissioning of the plant but the operation has been running by the local managers after the commissioning.

Several managers raised concern about the non availability of a fixed budget for training and development requirements as the percentage varies on the performance of the firm. This had been the concern mainly from the firms in very dynamic industries where their knowledge needs to be updated regularly to fulfill the customer requirements. They raised the point that though they are capable of handling many such new production requirements by modifying the machinery or the process, such

modifications some times lead to waste of time and resources. Some have also argued that the quality may not be achievable such as from the new technology so the quantity of rejects is generally higher in such cases.

The interviews also revealed that the foreign firm usually encouraged the local firms engaging in continuous improvements in the production process with full autonomy given on such trial and error testing for new changes. There were some cases in which the new local developments were even transferred back to the foreign firms or their other operations in other countries. Local managers claimed that they inform the foreign firm's management if a new change is tested in the process as a courtesy but that was not a requirement.

External and Internal Communication

Communication between the local firm and the foreign firm is done through multiple departmental level communication channels. All the technology related information has been done directly between the appointed technology managers in the local and the foreign firm. However, the general administrative and other corporate strategy related information is communicated through the CEO or MD of the firm. It seems to be understood that the parallel communication has eliminated any translating requirements as the gate keepers have technical backgrounds and familiar with the terminology. Many participants identified the requirement for the development of the internal communication on technology related information and they mentioned several factors such as poor understanding on the technology or the technical operation of the firm, organisational silos which obstruct inter department collaboration and the poor focus on the technology by the other functions could obstruct the effective communication among different function within the local firm.

Transfer of Technology

There have been several modes of technology transfers which had yielded different results after the transfer. The firms that had prior agreement on the involvement of the foreign firm in the technology transfer process had generally succeeded whereas the firms that had not extensively discussed nor understood the requirements before the transfer faced many difficulties.

There were several firms where the expatriates installed and commissioned the plant and had transferred only the basic operational skills to the local staff. The participants claimed that the local technology management had to struggle and do regular testing to develop internal capabilities to start a normal operation. Some managers claimed that it took a significant time to start receiving the proper use of the transferred technology. It was also observed that several such transfers had been of used machinery from another plant of the same foreign firm.

There have also been several other technology transfers where the expatriates have transferred operational skills and then the management skills to the locals and in such operations the firm has been running smoothly from the date of commissioning and the handover had also been smooth and effective. The participants mentioned that such technology transfers had been successful because the technology transfer process had been understood, discussed and negotiated with the foreign firm prior to the transfer. They also claimed that the relationships that have been developed with the expatriates during the transition period were led to effective communication on technology related matters after the hand over.

Among the firms interviewed foreign firms mostly transferred machinery, process developments, product designs and the skills to the local staff. Interestingly it seems that there had been no significant discussions of intellectual property rights in such transfers. The only presence of such was on new product designs and with new machinery. Many participants have said that Intellectual Property Rights were not a significant topic in the discussions but the mutual understanding and trust govern the intellectual property protection instead. This could be because the foreign firm is not transferring the latest advances in technology. However, the observation that IPR is not a critical issue for promoting technology transfer is consistent with some of the more recent literature emerging on SMEs in the Asia Pacific (MacDonald and Turpin, 2007 and 2008)

In many cases the transferred technologies have been customized or localized to match with the environmental requirements and the skills of the operators. Many of the sampled firms had been incepted with the collaboration with the foreign firm and the new technology had been received from the foreign firm. It was clear from the inputs that the technical level of the local staff is well sufficient for the smooth

operation of the plant and there has been low dependency on the foreign firm at the operation level. Most of the requests had been on programming/performance tuning and on the recently transferred technologies. It seems that the dependency is getting low and the technology operation by the local managers becoming more independent with time.

Applicability of Technology

It was observed that the transferred technology was either the technology that had been used by the firm or commonly used by the industry at the point of transfer. However, there were two types whereas the foreign firm has continuously updated the transferred technology so that the local firm has up to date technology and another set of firms where the technology that had been transferred many years ago is still used without updating. In the latter type of firms, the operation of the plant and fulfilling the customer orders are done by frequent modification in the machinery and process by the local skilled staff.

Almost all the participants agreed that the transferred technology had added value to the firm and the common reason was that the technology that had been transferred from the foreign firm was either totally new to the country or more advanced than the technology used by the other firms in the local industry.

7. Conclusion

Sri Lanka is a country that has attracted considerable FDI since 1977 but has not received the expected technological transfer as flow-ons from such investment. It remains technologically backward compared with other regional countries such as the Philippines and Indonesia though all three countries have somewhat similar characteristics in GNI per capita, literacy rate and GDP composition. It has been proposed in this study that the difference in performance in technological capability development in Sri Lanka has much to do with the nature of interface between expatriate and local managers. The first round of field-work for the present study therefore focused on the extent of and the way in which autonomy is transferred from expatriate to local technology managers.

Preliminary observations from the data gathering in Sri Lanka suggests that the skills and the exposure of the local technology managers in the FDI firms was impressive. Further, those skills have enabled them to perform well in their business role even when the technology transfer was incomplete. Furthermore, the importance of clear understanding and agreement on the technology transfer process during the negotiations was clear. It was observed that the Sri Lankan managers have been given autonomy in operational level decision making whereas the foreign firm is involved in strategic decision making. The management interface and the transfer of management skills *and* autonomy was clearly an important factor for technology transfer among the more successful firms.

The next phase of this study will undertake a more thorough analysis of the data and seek to explain the extent to which *management transfer* leads to technology transfer and subsequent *technology spillover*. The study is, at this stage, still exploratory and further work will need to be undertaken to present the Sri Lankan experience in a way that can be usefully compared and contrasted with experiences in other countries such as the Philippines and Indonesia.

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